Category-Theoretic Tools to Support Manufacturing Information Integration

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The official link for this solicitation is: http://www.grants.gov/web/grants/view-opportunity.html?oppId=275010

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Department of Commerce

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Description:

This subtopic is calling for a software tool to test the categorical formalism on integration problems in smart manufacturing and additive manufacturing. Category theory has been identified as a flexible and straightforward mathematical formalism for establishing compatibility of information structures and setting up the required information exchange. The software tool must enable the creation of the category-theoretic mappings needed for integrating different information models in multiple domains. In addition, the tool must be scalable so that it can be used to solve integration problems of varying size and complexity and integration problems that change as systems evolve over time. This is crucial to the eventual commercialization of the tool.

The project goal is to develop prototype tools that can represent manufacturing information objects, currently stored in Excel spreadsheets or SQL-type databases, as categories and demonstrate that the tools enable the integration of information across these two representations.

Phase I activities and expected results:

- Develop a small-scale manufacturing-related demonstration software tool that can visually

represent the information objects.
- Demonstrate how to merge the databases.
- Demonstrate how to answer a selected set of queries using the merged database.

Phase II activities and expected results:

- Expand tool to integrate software tools when data is captured in Excel spreadsheets.
- Demonstrate that the tool works for a small manufacturing example.
- Demonstrate that the new tool works on realistic problems that involve both databases and Excel spreadsheets.

NIST will be available to assist the awardee to choose scenario and information objects.

Reference:
1. Spivak, D. *Category Theory for Scientists*, MIT Press. (October 2014).